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POWER SOURCES PANEL

1. The Agency's power sources program has a number of both positive and negative aspects. Included in the former is the fact that full use is made of National capability, both governmental and industrial. This includes the regular use of Project Brief Sheets which are issued and maintained by the Inter-Agency Advanced Power Group. The present program is responsive to the Agency's long range objectives.

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2. Some program weaknesses have been inherent and are likely to remain so. Unique requirements dictated by operational factors cause the bulk of our efforts to be devoted to the special purpose power supply field. This covers a range from adaptation of an established technology to early exploitation of a new concept. Such work tends to be quite costly (typically a \$500K effort over a period of several years to get a new power source ready for operational use). The problem is compounded by the fact that there is no extensive bank of experience to draw on for help in making decisions on which present systems should be pursued to the exclusion of others. Also, testing of primary electrochemical cells (non-rechargeable) is inherently destructive and sufficient quantities must be tested to provide adequate statistical data for evaluation. Further, there is no known reliable method for accelerated testing; thus, to establish the required degree of reliability for Agency applications is time-consuming and expensive.

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3. The question of using nuclear power sources raises problems with regard to both cost and policy. Radioisotopic thermoelectric generators (RTG's) are singled out because of the advantages they offer compared to any other power sources. Unit costs are not readily predictable but are expected to be \$1,000 to \$20,000. Should Agency requirements necessitate major modifications, they could conceivably be much higher. At present we are lacking a policy statement as to any intent to use RTG's overseas.

4. Three technological gaps, due to policy/cost prohibition or lack of technical concept, are discussed: requirements, system life and data base. Requirements often arise from a user's specifications rather than from being mutually developed with a power source expert. Another aspect of the problem is that transfer of an initiator of a requirement which leads to an R&D effort too often leaves a void and continuity is lost. System life will continue to remain as a gap until capabilities such as nuclear sources, solar arrays and fuel cells are available and operationally acceptable. A data base is lacking because of the specialized ways in which we use power sources. It's development would be long and costly because manufacturers and developers have little incentive to acquire the type needed for our engineering evaluations of the use of their products.

5. The current in-house manpower level of about three man-years is grossly inadequate and present organizational structure does not provide for an integrated effort.

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6. A number of recommendations are made, ranging from increased personnel and funding to major organizational changes and policy decisions. Six to eight people are needed for continuing operations at the present level. Financial resources should be increased to not less than annually with provisions "to support more costly, specific ventures." The establishment of a "centralized Power Source Activity" is recommended. Its location in Agency structure is judged to be beyond the immediate scope of the Panel's effort but seems to lean toward TSD or ORD. A policy statement is needed regarding use of RTG's which will bound the conditions of their approved use or clearly state the mechanism for obtaining an early decision for specific project use.

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Power Sources

The Agency's direct expenditure in the development of power sources is comparatively small and generally directed to accelerate developments or improvements which would not likely be undertaken by industry for commercial purposes.

The achievements in this area, from an operational point of view, have not been of great significance to date, and this may continue to be the case. The Agency has not devoted the resources required in order to have a significant impact in this field. For example, simply procuring sufficient batteries of a new type to assure reliability has strained the funding in this area from time to time. On the other hand, there is an increasing potential for the development of new kinds of sources as material processing techniques improve. The general trend is towards realization of the theoretical power source capabilities.

Of the initiatives proposed by the Panel, continued effort on radioisotope supplies should be maintained. The low level of funding which might be provided for solar, hybrid, and other systems would have little impact in these areas, and these funds might better be devoted to obtaining a more rapid operational capability in the radioisotope field.

As elsewhere, the effort in this area should be integrated as the Panel suggests; the efficiency in the program cannot be increased to its maximum by coordination, and the Panel has presented a convincing case.